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eContentplus

This project is funded under the *eContentplus* programme¹,
a multiannual Community programme to make digital content in Europe more accessible, usable and exploitable.

¹ OJ L 79, 24.3.2005, p. 1.

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2 Project Objectives

In the medical and healthcare education throughout Europe there is already a considerable quantity of existing digital content created by many educational institutions. However these resources are normally only used by the creator institution and are either unused or even not available to other institutions from the wider community. The educational needs of the subject precisely coincide with the eContent*Plus* Programme vision, to support projects that will make digital content in Europe more accessible, usable and exploitable by addressing specific market areas where development has been slow. The Programme also aims at facilitating access to digital content, its use and exploitation, enhancing quality of content with well-defined metadata, and reinforcing cooperation between digital content stakeholders. In addition, it aims to tackle multilingual and multicultural barriers.

The eViP project sets out to address these issues within medicine and healthcare by joining up nine of the leading e-learning institutions in Europe and repurposing and enriching much of their existing digital content, in the form of Virtual Patients (VPs), to different languages, cultures, disciplines, and contexts in order to create an easily accessible and metadata-enriched bank of 320+ VPs for the improved quality and efficiency of medical and healthcare education across the European Union.

The objectives of the eViP project over the three years are listed below:-

Objective	Year
Collate VPs from partners' existing collections and select cases for repurposing to local educational needs	1
Implement common technical standards for all VPs in collaboration with MedBiquitous	1/2
Restructure content to standards-compliant structure, metadata including the culture and language metadata of the partners (English, German, Dutch, Swedish, Polish, Romanian) and content packaging; all to enable "multi-lingual access"	1/2
Promote the inter-professional sharing of VPs between different healthcare disciplines such as medicine, nursing, physiotherapy and dentistry	2
Further enrich the content of the repurposed VPs with the addition of supporting resources e.g. supporting basic and clinical science resources, clinical skills videos, owned by the partner or in the public domain, or available under an appropriate Creative Commons license	2/3
Evaluate how the repurposed and content-enriched VPs meet the individual needs of the project partners and the wider community	2/3
Share enriched VPs with the wider EU community through an online referatory	3
Share templates and tools within the EU community for the easy creation of new VPs	3
Disseminate best practice guidelines for creating and sharing VPs and evaluation instruments for VPs and for learning & teaching activities using VPs	3
Embed a sustainable model for the storage and retrieval of VPs beyond the	3

It is worth noting that all year 1 and 2 objectives have been achieved by the team.

3 Consortium

The eViP project partners are listed below:

- St George's, University of London (England)
- Karolinska Institutet (Sweden)
- Medizinische Fakultät der LMU München (Germany)
- University of Warwick (England)
- Faculty of Medicine Maastricht University (Netherlands)
- Universitätsklinikum Heidelberg (Germany)
- University Iuliu Hatieganu Cluj-Napoca (Romania)
- Faculty of Medicine, Jagiellonian University (Poland)
- University of Witten/Herdecke (Germany)

Due to the complex nature and the transformational change expected as a result of eViP, it was decided to take a Programme approach to the activities proposed. So, the eViP workpackages are considered to be project in themselves which are about delivering outputs to time, cost, and at the agreed standard/quality. Whereas, the eViP project as a whole is about delivering the outcomes from and realising the benefits of the separate projects.

The individual eViP projects that fit underneath the eViP project 'umbrella' are detailed below:

- Project 1 (WP1) Pilot case study and evaluation (led by St George's, University of London from September 2007 to December 2007)
- Project 2 (WP2) Standards implementation (led by the Karolinska Institutet from November 2007 to December 2008)
- Project 3 (WP3) VP repurposing and enrichment (led by the Karolinska Institutet from December 2007 to July 2010)
- Project 4 (WP4) Awareness and dissemination (led by the University of Warwick from September 2007 to October 2010)
- Project 5 (WP5) Assessment and evaluation (Faculty of Medicine Maastricht University from September 2007 to October 2010)
- Project 6 (WP6) Exit and sustainability (led by Medizinische Fakultät der LMU München from September 2009 to October 2010)

Although each project is led by a partner institution, the work involves the input from all the eViP partners. Evidence-based Programme and Project Management methodology is employed by all partners over the entire course of the eViP lifecycle in order to successfully

meet the outcomes of not just eViP but also to contribute to the outcomes envisaged of the eContentplus programme.

4 Project Results/Achievements

WP1 The Pilot Study

The purpose of the repurposing and content enrichment pilot (WP1) was to:

- (i) explore the feasibility of repurposing and enriching VP examples in a variety of different ways, and for different purposes
- (ii) collect feedback from the staff on repurposing and enrichment process
- (iii) collect student feedback on use of the repurposed and enriched VPs.

This work was originally planned to be carried out by six of the eight project partners but in the event was conducted by all project partner institutions.

Partners were free to repurpose and enrich VPs in any way they chose, with the intention of covering most of the needs of the partners during the course of the project. Partners were required to capture feedback on a range of approaches to repurposing and enriching VPs, and thereby inform the process of use by other nations, both during the project, and at the project conclusion.

The eViP application profile created in the workflow of WP2 was tested for technical interoperability in this pilot study.

The study proceeded in a number of distinct steps. Firstly, partners collectively created, agreed, and finalised a comprehensive glossary of project specific definitions for the different types of repurposing, and content enrichment. Following this a VP inventory was created which categorised the different VP types and the way in which they were currently implemented. Partners then repurposed a total of 19 cases selected from the inventory. Partners repurposed and/or content enriched the VPs in a variety of different ways e.g. repurposing to different educational scenarios, to different healthcare or subject disciplines, for different educational levels, for multilingual use, to different structures and finally with content enrichment. All partners obtained feedback from staff involved in the repurposing and content enrichment process, the majority also conducted student evaluations and feedback, using a variety of tools which included web-based-, email-, and paper-based questionnaires, and both face-to-face and online interviews.

The partners successfully demonstrated repurposing and enriching for the full range of different uses described in the original rationale for VPs. In some instances repurposing and enriching was more time consuming than expected, but all types of repurposing were less effort than creating a case 'from scratch'. Content enrichment was a particularly efficient use of time, since in several cases the resources were already available. In most cases the partners had managed to obtain feedback from both staff and students. In all cases, there was strong support from content experts, staff and students for the future use of the repurposed and enriched VPs.

WP2 Standards Implementation

This work package started by developing a technical specification of what is needed to adapt virtual patients (VPs) to a common standard, to enable the VPs to be shared between different

virtual patient systems. The main outcome was the eViP implementation profile that includes adaptations of three existing standards/specifications:

- The MedBiquitous MVP Specification which defines how to encode VPs using xml
- Metadata about the VP is expressed using the Healthcare LOM standard
- The VP is packaged using a customized version of the SCORM standard

The eViP implementation profile was then published with appropriate conformance metrics (D2.1). The conformance metrics provided a systematic approach of verifying whether a VP system meets the eViP implementation profile specifications.

The implementation of the eViP profile was successfully conducted by the eViP technical reference group. A number of documents describing the implementation efforts were created and published on the eViP website along with best practice implementation guidelines and the actual demo content packages.

Another important activity, in collaboration with other work packages, was undertaken to develop a common consent form and a licensing model framework to be used across the project (outputs described later in this report). This work will continue in accordance with WP6 (Exit and sustainability) in the final year of eViP.

This work package has shown high achievements by being the internationally recognised current leader in the standardisation of VPs. Furthermore the development of a common European consent form will be very valuable to the whole medical education community.

Work package 2 has played a substantial role in addressing the Programme's overall objective to tackle organisational barriers and promote take up of leading-edge technical solutions to improve accessibility and usability of digital material in a multilingual environment.

WP3 VP repurposing and enrichment

This work package started in December 2007 and will be ongoing to July 2010. All members of the eViP consortium have been very active in WP 3 and there is a firm commitment to the important work of WP3 and to ensure that the bank of 300+ repurposed VPs are delivered to the wider medical and healthcare education community.

This is the backbone of the eViP project and includes eight separate objectives and milestones and six deliverables. However, many of these are long-term goals that are due towards the end of the project.

The Deliverables for the whole duration of the WP 3 are identified as:

- 3.1 Identify and set up an inventory of all possible VP cases from partners and identify any IPR issues
- 3.2 Identify which of the existing VPs are to be repurposed, based on medical and healthcare specialties, to different cultures and languages
- 3.3 Re- purpose VPs to be standards compliant, with metadata and packaging, for multi-lingual access: 'normalisation' and enrich content using partner's existing resource collections
- 3.4 Repurpose a subset of normalised new VPs into new disciplines
- 3.5 Repurpose normalised new VPs into new cultures
- 3.6 Peer review VPs in each culture

- 3.7 Evaluate metadata schemes for eViP VPs
- 3.8 Populate the project referatory

Since the start of the project, a number of deliverables have been submitted to the EC.

- D3.1 Identify and set up an inventory of all possible VP cases from partners and identify any IPR issues. See below for details re this deliverable.
- D3.2 Populated repository of VPs as selected in 3.1
- D3.3 Report on set of new repurposed standards compliant VPs, with metadata, and packaged, for multilingual access

D 3.1 has been fulfilled and approved by the EC. All partners had been active in collecting details of their respective existing VPs that could be candidates for re-purposing. A list of all VPs available had been posted in the eViP Wiki.

D 3.2 was submitted to the EC as a Web-based referatory that can be accessed though the eViP website. The referatory holds a list of VPs in English, Romanian, Swedish, Dutch, German and Polish. These VPs were originating from four different VP authoring systems, namely Open Labyrinth, Web-SP, Casus and Campus. These cases cover mainly the Medical discipline, but VPs from Nursing, Dentistry, Midwifery, Paramedicine as well as some other disciplines are represented.

D 3.3 was submitted to the EC and is now available on the report is now available on the eViP website. It was developed in close collaboration with D2.2.

In addition, the work in WP3 has also been targeting parts of the upcoming Deliverables D3.4 Report on set of localized new VPs into new disciplines and new cultures and approved peer review process. Initial work on D 3.5 Report on and creation of metadata schemes for eViP VPs as well as D 3.6 Complete referatory of repurposed, standardised and localised VPs for different disciplines, including metadata descriptions, has also begun.

We expect that all Key Performance Indicators relating to WP3 will be achieved by the end of the project, most significantly the final target number of 300+ VPs.

Both technical and practical issues regarding the eViP referatory are also being discussed. In close collaboration with WP4, the team are also investigating the use of other repositories such as MedEdPORTAL and/or JORUM.

A number of interesting and positive additional outcomes of the eViP WP 3 work have also been reached. Among these can the following seven results be mentioned:

- Most pre-eViP cases have been re-validated and re-checked for any inconsistencies
- Most of the partners have been able to solve and verify IPR issues for existing cases
- Content validation of existing English cases have been made
- The contact between teachers at the local universities of the eViP partners and the eViP team has been improved
- A number of interesting research possibilities have been found
- Registration of new PhD students within the field of VPs

- Increased visibility and impact on the teaching community (at universities and at conferences)

WP4 Awareness & Dissemination

This work package started by producing the project's public website and private wiki (D4.1). The public website had been reviewed by an EU independent assessor and passed as being fit for purpose. The project has a high profile on Google and is currently the top search result for acronym and project name, and currently 5th place for the generic term 'virtual patients', which is a major achievement for such a rapidly expanding field. There is a plan for improving the public web site following feedback from project members, users and the independent assessor. Improvements include a stronger visual brand, better in-site navigation and a public collaborative space based around a wiki. The private project wiki has proved to be an extremely efficient way of document project progress and is a comprehensive record of all aspects of project activity.

The six-month stage of the project saw the publication of a public report on virtual patient case studies drawn from project partner institutions. This comprehensive report is an excellent starting point for any group exploring the current use of virtual patients in medical education. The report can be found on the projects public deliverables web page:

<http://www.virtualpatients.eu/about/timeline/>

The end of the first year of eViP saw the publication of a comprehensive virtual patient survey covering areas such as current use of virtual patients and virtual patient systems, the range of education scenarios using virtual patients, and some of the business issues behind accessing a repository of virtual patients and related materials. Results of the survey can be found in D4.3 on the projects public deliverables web page:

<http://www.virtualpatients.eu/about/timeline/>

All partner schools in the eViP consortium have been actively involved in academic and technical meetings to raise awareness of eViP and virtual patients in general. A summary of presentations given and major conferences attended can be found on the project's weblog:

<http://www.virtualpatients.eu/weblog/>

The appointment of a dissemination officer at Warwick has significantly improved the profile of eViP in the 2nd Year. By engaging with social networks awareness of eViP project activities has reached a bigger audience, and technologies such as Twitter have perhaps reached individuals who would never have visited the web site. The search terms 'evip' and 'virtual patients' are 1st and 3rd results respectively in Google, indicating that the profile is high for anyone searching for these terms. It is unlikely that the profile for eViP and virtual patients could be improved upon in terms of conventional search engines. For the coming 12 months and final project year the emphasis will be on creating a 'buzz' about the project and to get more individuals tweeting and blogging about eViP. The number of peer reviewed papers is likely to increase during this period, and the major dissemination event in London during April 2010 will ensure that the profile remains high in the academic medical education community.

WP5 Assessment and Evaluation

This work package started with a detailed inventory of the existing Virtual Patient (VP) types and VP implementation scenarios within the eViP consortium. The findings were reviewed by all partner and the key results were presented to the EC as part of the 1st half year report of the project (D5.1). The inventory provided the consortium with an overview essential for planning the repurposing activities in WP3, but it also raised, in an early stage of the project, the awareness of the manifold aspects regarding the development and implementation of VPs.

Since then, this work package developed two instruments to evaluate the quality of VPs that the partners were going to repurpose and enrich. One is a checklist for developers and teachers to audit the construction of a VP. With this instrument each VP could be characterized with a 'fingerprint'. The other is a questionnaire for students recording their experiences with a specific VP. Both instruments are reviewed by all partners. The student questionnaire is published on the project website in the 5 languages of the partners. For feasibility and validity reasons the checklist is only published in English.

In addition each use of a repurposed VP by a student will be evaluated with the questionnaire. To facilitate this continuous evaluation process an online Evaluation Database (EVDB) for eViP was created and is now used by the partners. This EVDB was also submitted to the EC and approved.

The team setup an Assessment and Evaluation Reference Group to coordinate the activities of the partners to address D5.3 in which we will evaluate the VP-designs and VP-integrations (scenario's) mentioned in the DOW. Our effort will be to address as many independent variables as possible and research their effect on one or more of the 3 levels of Kirkpatrick: use, reaction and learning. Since then, a number of evaluation instruments have been created and our repurposed VPs have been evaluated by students. Next to the regular online meetings in Wimba we planned and organised a mini symposium in Krakow alongside an eViP team meeting for partners and also intend to plan a mini conferences in January 2010 in which all partners will present how their research will cover the indicators for assessment and evaluation. This mini conference will also be used to discover possible alliances and to distribute the assessment and evaluation effort equally over the partners.

5 Target Users & their Needs

The project's current user group is well known as a result of the needs analysis survey (D4.3). Based upon 216 survey responses collected, the demographic profile of users engaged with the eViP project so far is:

Region	Percent
Europe	35%
USA & Canada	48%
Rest of world	17%

User's Role	Percent
Non-clinical	25.6%
Clinical	62.5%
Professionalism	34.4%
Skills	40.6%
Curriculum	53.1%
Technology	35.6%
Assessment	42.5%
Management	29.4%
Accreditation	25.6%
Evaluation	35.0%

Level	Percent
Undergraduate	61.9%
Postgraduate	56.9%
CME/CPD	39.4%
Interprofessional	23.8%

Age of respondent	Percent
<21	1.2%
21-30	13.8%
31-40	18%
41-50	29.3%
51-60	25.1%
>60	12.6%

Based upon this profile information we have a very clear idea of the individuals currently engaged with eViP. Perhaps it is to be expected that the majority of individuals interested in virtual patients is still biased towards the US & Canada. The likely explanation for this is that the US hosts the MedBiquitous virtual patient working group, the largest formal group, preceding eViP, researching in this area.

It is also interesting to note that the age profile of survey respondents shows that eViP is engaging more established teachers and clinicians. Students are not currently the main priority for eViP but reaching younger teachers, clinicians and academics will be an aim, through the WP4 activities.

The wide range of roles of survey respondents has shown that professionalism and skills are well represented. These two areas have perhaps not been addressed by virtual patient scenarios as well as some of the other areas in eViP so partners will re-examine their contributed virtual patients and look for opportunities to include aspects of professionalism and skills-based training in their scenarios.

6 Underlying Content

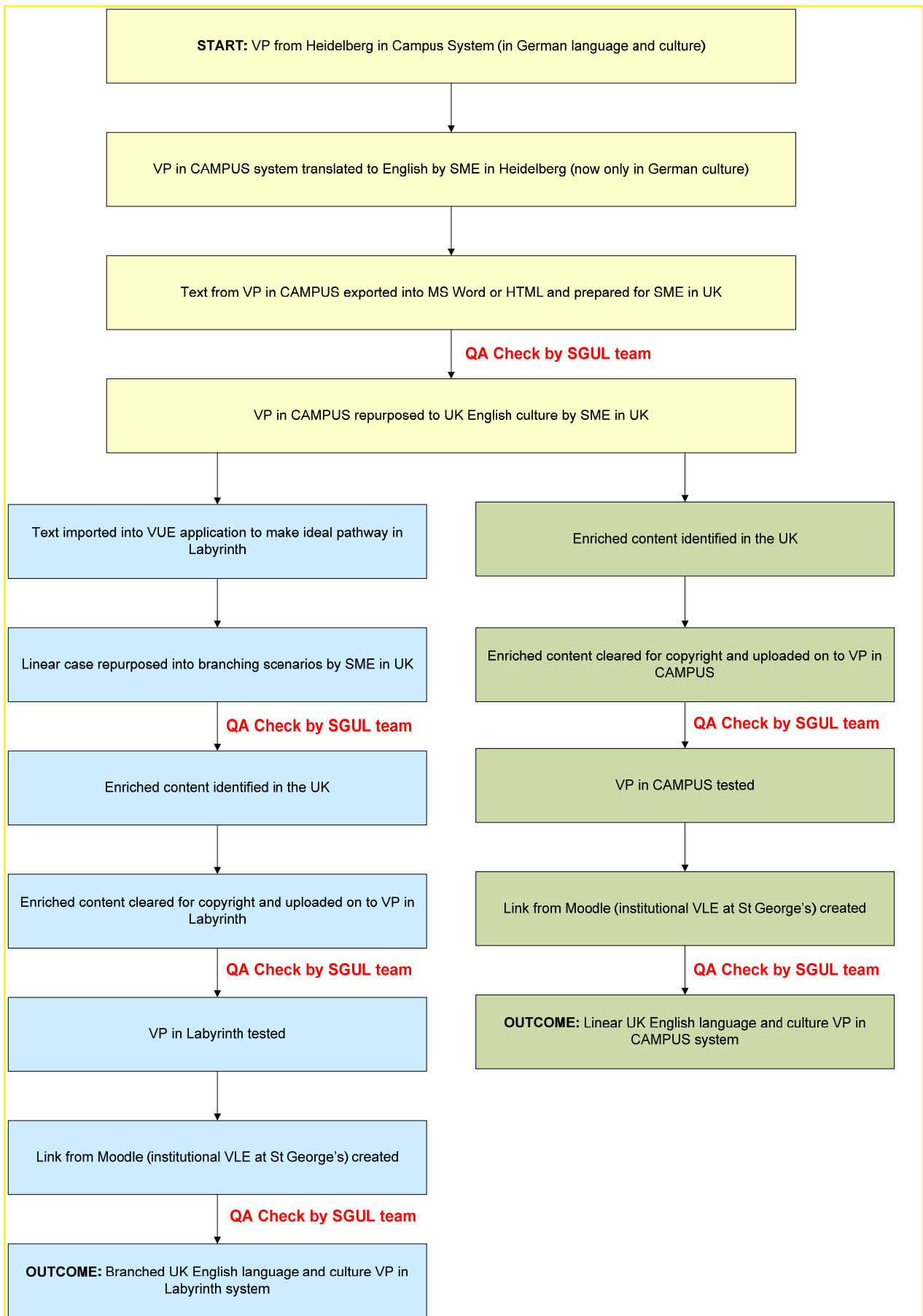
As per the agreed Description of Work, the eViP partners have ALL contributed 300+ VPs and associated digital resources to the consortium for repurposing and enriching. These resources are available in all partner languages.

All of these VPs have been collated in the eViP referatory:

<http://www.virtualpatients.eu/referatory>. In addition, each of these has been further enriched with metadata. Below is a list of all the mandatory eViP metadata associated with each VP along with a short note providing more of a description:

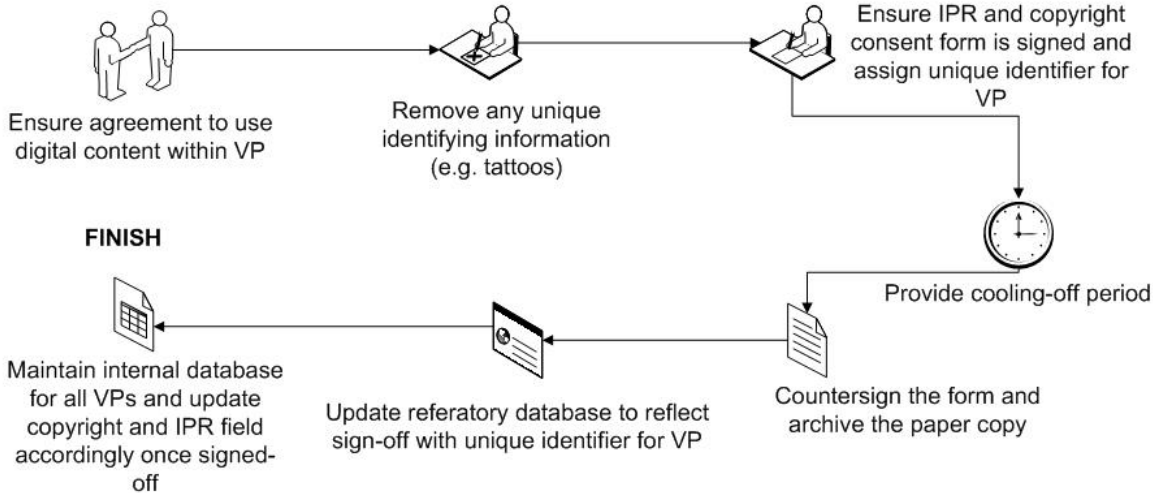
Field	Notes
LOM 1.1 repository id	Unique ID generated by referatory
LOM 1.2 title	In English please
LOM 1.3 language of resource	in the format en-gb, en-us etc
LOM 1.4 description	In English please.
LOM 2.3.1 role of contributor	e.g author of VP, owner, etc - not the same as the person creating the inventory record
LOM 2.3.2 author	Name of contributor
LOM 2.3.3 date	Date of contribution
LOM 3.2.1 role of metadata contributor	e.g creator or validator (of metadata record - not the VP!)
LOM 3.2.2 author	Name of metadata creator
LOM 3.2.3 date	Date of metadata record creation
LOM 4.1 technical format	use MIME type e.g application/zip for content packages
LOM 4.2 object size in bytes	estimate if not known exactly
LOM 4.3 location of object	must only be URL/URI to object if available
LOM 4.6 special requirements for use	defaults to 'eVIP compliant player'
LOM 5.2 type of resource	defaults to 'Virtual Patient'
LOM 6.1 payment required	yes/no only
LOM 6.2 subject to copyright	yes/no only
LOM 6.3 statement of copyright	free text describing copyright statement
LOM 9.2 classification purpose	'discipline', 'educational objective' or 'competency'
LOM 9.2.1 classification source	e.g 'MeSH'
LOM 9.2.2.1 classification node identifier	e.g C14.280.434
LOM 9.2.2.2 classification label	e.g 'Heart failure'
eVIP 11.1 id in original system	ID in local system
eVIP 11.1.1 originating vp system	name of originating VP system e.g 'Labyrinth'
eVIP 11.2 sex of vp	Male/Female
eVIP 11.3 age of vp	Please either enter a numerical age or 'Neonate' (<4 weeks), 'Child' (<16), 'Adult' (<70), 'Elderly' (>70)
eVIP 11.4 learning	What did we agree in Munich should go in here?
eVIP 11.5 used by students	We used this in the original inventory but we agreed not to make it mandatory from now on
eVIP 11.6 institution	Temporary field including institution that owns the VP - will be replaced by vCard
eVIP 11.7 contact email address	Temporary field with email contact - will be replaced by vCard

The quality assurance of the repurposed and enriched VPs was key to the overall success. Using the repurposing and enrichment flow diagram between SGUL and HD as an example, this highlights the number of areas where partners implemented quality assurance checks to ensure that all VPs and their associated resources were of high quality.

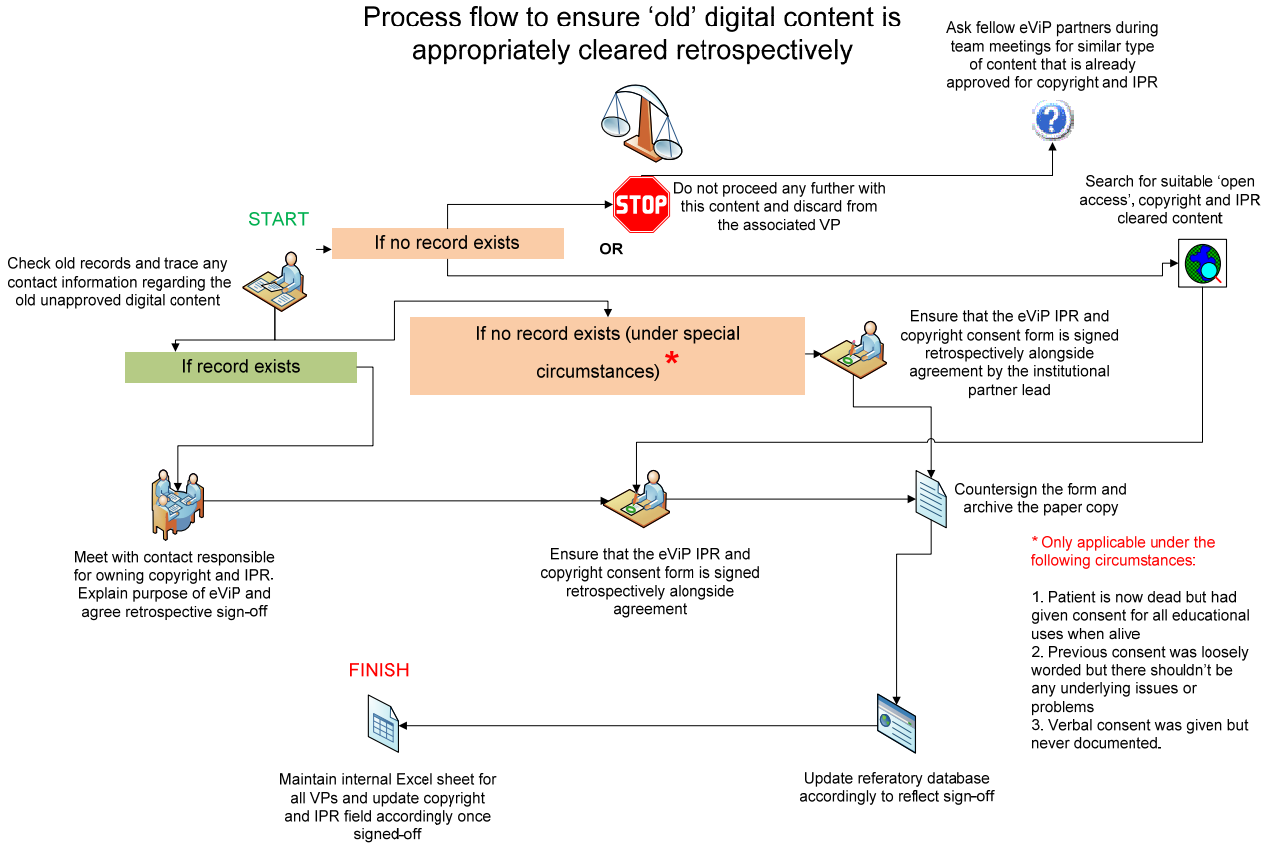


In addition ALL partnering institutions had agreed to adopt the Creative Commons as the licensing model of choice for eViP and also agreed to make sure all content to be repurposed and enriched (both the original and repurposed) were cleared for intellectual property use in the context of eViP. Using the flow diagrams shown below, partners agreed to clear off any outstanding issues relating to IP retrospectively for existing content but also managed to develop a workflow to inform the wider community for sharing new content. The team worked very closely with the Creative Commons to ensure that these workflows were quality assured and approved by an international licensing organisation as well as all the jurisdictions relating to each of the partner countries.

Workflow for new content:



Workflow for old content:



7 Summary of Activities

- Conducted an initial local meeting of all project partners
- Selected staff to work on the project and continually monitor their progress
- Selected 19 VP cases for pilot study at the start of project
- Established project website for wider community and wiki for internal partners
- Repurposed 19 pilot VPs and tested with students and staff
- Developed empirically tested workflow for repurposing VPs from pilot study.
- Published eViP application profile with appropriate conformance metrics
- Created detailed inventory report of existing VPs among partners
- Created inventory of pedagogical scenario's and VPs design
- Published virtual patient case studies to inform other groups
- Started repurposing eViP cases based on approved list of existing eViP VPs
- Developed and published eViP conformance testing VPs and scenarios
- Conducted design based research of VP's and different implementations
- Completed eViP VP Profile implementation and conformance testing in all partner systems
- Completed and published evaluation of third party tools and systems
- Implemented common consent and licensing DRM framework across project
- Published documentation and best practice guides for all work carried out in eViP
- Developed set of new pilot repurposed standards-compliant VPs, with metadata, including local health culture and language, and packaged, for multi-lingual access
- Developed a set of repurposed VPs from one discipline to a new
- Conducted design based research of VP's and different implementations
- Published good practice guidelines to promote the eViP approach and to prepare the community as part of exit & sustainability

8 Impact & Sustainability

The eViP project catalysed a global change in virtual patient development in three main areas

1. Development of common standards for interoperability.

The development of the MedBiquitous Virtual Patient standard was rapidly accelerated and extended by the representatives from eViP partner institutions, in order that the standard could be completed and submitted by the end of the eViP project. The eViP Work Package 2

(WP2) deliverables (regarding Application Profile, Conformance Testing and Best Practice Guidelines) were key lessons circulated to VP working group members, to underpin the creation of MVP application profiles for different VP models. The eViP Application Profile forms part of the basis for the all MedBiquitous VP working group meetings.

A number of specific features were added by eViP partners as the eViP requirement for practical usage of VPs extended the standard. Two of the eViP partners (Karolinska and Heidelberg) produced the only currently existing automated tools for conformance testing of Virtual Patients. Initial discussions have taken place about the possibility of running eViP conformance tools from MedBiquitous website as a validation tool for VP standard. Significant additions and changes initiated by eViP partners included the implementation of counter rules, introduction of default values to attributes, and alternative paths for extensible elements.

2. International awareness of Virtual Patients

eViP has been the main global factor in the increased awareness, presentation and publication of virtual patient developments and outputs:

AMEE- International Association for Medical Education

In September 2007, the year before the official start of eViP, the contribution of eViP to AMEE was one poster presentation. In total, there were 6 virtual patient presentations, only two of which were led by eViP partners.

By AMEE 2008, the number of VP presentations had increased to 18, and took up three separate sessions. 9 of these presentations were eViP partner-led. There was one keynote presentation, and two 2 eViP-led workshops, which were amongst the first workshops to be fully-booked. The profile of the eViP project was such that the Programme Director was asked to arrange all VP and eLearning sessions at AMEE.

Medbiquitous Annual Conference 2008

eViP presentations were the largest subject contributor at Medbiquitous international Medical and Healthcare Standards Annual Conference, dominating the virtual patient presentations and representing nearly half of all the presentations. eViP received the International Innovation Award.

Ist International Conference in Virtual Patients 2009

An eViP partner from Jagiellonian, Krakow Poland, proposed, led and hosted the highly successful 1st Conference on virtual patients. JB McGee noted that “80% of all the people I would want to see at a conference of this type, were here!” The second Conference in this series will now take place in April 2010 and is capped at 200 delegates.

Publications

The most significant step in virtual patient publishing has been the commissioning of a special Virtual Patient issue by the ‘Medical Teacher’ journal, with approximately 75% of the publications involving eViP partners.

3. Integration and embedding of VPs into medicine and healthcare curricula

The eViP project had a significant impact on all partners, who at the onset of the eViP project, were at widely varying stages of development and embedding of VPs in their curricula, viz.

- Two of the institutions, Jagiellonian and CLUJ, had never created nor used virtual patients
- Others such as St George's, Warwick and Maastricht had embarked upon the process of developing virtual patients, but had not reached the stage of embedding them to any significant extent in their institutional teaching.
- Only Munich and Karolinska and, to an extent, Heidelberg in Paediatrics, were consistently using VPs in their curriculum.

The emergence of the eViP consortium changed the position of each institution significantly within two years, as the case studies describe. The partners used the critical mass of the consortium to push ahead VP development in the individual institutions. For example, at Maastricht 'the collaboration with other European institutions in the e-ViP project and its funding by the EU made it possible for the Department of Educational Research and Development of the Faculty of Health, Medicine and Life Sciences to put virtual patients on the agenda as a learning tool for the undergraduate medical curriculum.' Similar steps were taken by other partners.

By 2009, virtual patients had become, to differing degrees, a significant element within the curriculum of all partners, and in one case the virtual patient had taken over as the central learning style of a significant section of the undergraduate curriculum.

The eViP dissemination strategy was extended to create and inform a community of VP practice built around the eViP website, which carries news, views, articles and resources of general interest to a widening VP community.

Increasingly partners are now developing international links which will build a global web of VP developments and implementations beyond the life of the EC programme.

Below are a series of case studies which show in detail the impact of eViP on the progress in implementing VPs in the partner institutions, and the emerging relationships with non-partner institutions.

Institutional Case studies

Integration and embedding of VPs into medicine and healthcare curricula

Jagiellonian University Medical College

Jagiellonian University Medical College (UJ) started into the eViP project with little experience in developing virtual patients and embedding them into curricula. The only previous experience was a prototypical implementation of the *BIT Exam* branched VP system [1][2] and introduction of the *Laerdal MicroSim* simulator into the Emergency Medicine course by the Anesthesiology Department.

2007

Four months after joining eViP Jagiellonian University repurposed two cases from the LMU (CASUS[®] system) and presented them as a pilot study to 3rd year medical students within the Telemedicine 2 course [3]. Over 100 students took part in the study that was continued into the first weeks of 2008. Students graded the cases very highly. The question whether VP contained valuable information for students was answered in average with 4,1 in 5-point Likert scale.

2008

The year 2008 UJ devoted mainly to repurposing activities and creation of a database of cases that could be introduced into the curriculum. Nevertheless some integration activities also took place. Two VP cases were presented to ca. 60 foreign English-speaking medical students in the Basis of Computer Science classes. Another two cases were presented to the next year of the Telemedicine 2 course (similar scenario and results as in the eViP Pilot Study). The number of participating students was over 200.

Learning using virtual patients was also promoted to the faculty and medical and healthcare PhD students by a series of invited lectures given in Kraków by Martin Fischer and Mathias Holzer from LMU. After the lectures the PhD students were assigned into groups of 2-3 and prepared their own virtual patient cases (LbT, Learning-by-Teaching scenario). 14 new VPs were created in that way.

UJ worked also on the technical aspects of introducing VPs into the curriculum that would align with the existing e-learning infrastructure and would allow conducting research studies. Fig. 1 presents the elaborated workflow. First the list of students is exported from Blackboard VLE as Microsoft Excel spreadsheet. If the scenario requires so the students may be assigned randomly into different groups with individual sets of virtual patients. Students are enrolled into the CASUS system by scripts generated semi-automatically from the Excel spreadsheet and then invited to the VP course by automatically generated e-mails containing a TAN access code to the relevant CASUS cases. The e-mails contain also links to the eViP evaluation tool for student assessment of the cases. Finally the data from the student evaluation questionnaires and tracking-monitoring tools from CASUS is exported as Excel spreadsheets and may be analyzed in statistical packages. This workflow has been applied in three integration/evaluation scenarios conducted in 2009.

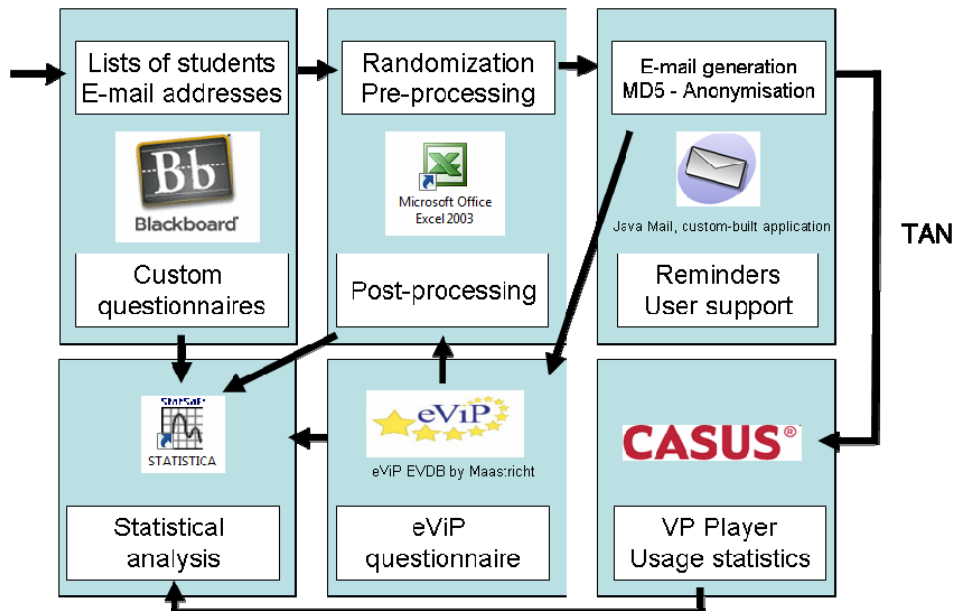


Fig. 1 Workflow for Integration of Virtual Patients into the E-learning infrastructure of the medical faculty

2009

In 2009, the learning-by-teaching scenario from the previous year was repeated for a next group of over 40 medical and healthcare PhD students resulting in 20 new interdisciplinary VP cases. Some of the PhD students decided to stay with the UJ's eViP team after the course and prepare new cases for the database and then to introduce them into their own teaching activities.

A course in first aid techniques consisting of 7 cases was prepared on the CASUS platform and introduced as a supporting material to be completed by 1st year medical students (approx. 100) before traditional classes (one case a week). Effectiveness of VP supported learning is compared to non-intervention group. Results are pending.

Two VP cases were presented as a self-study material for nursing and obstetrics students (approx. 200 students). Students were encouraged to use the cases by announcements on lectures (presented as a good preparatory material for the coming examination) and e-mail invitations [5]. Invitations to an extracurricular VP case on cystic fibrosis (in two variants) were sent by e-mail and announced on discussion boards to a group of over 200 3rd year students of medicine [4]. Another two VP cases have been presented to a group of 80 dentistry 3rd year students within the Medical Informatics and Statistics course. Classes on virtual patients were also introduced into the elective e-learning course for 4th year medical and dentistry students and telemedicine course conducted for 4th year applied computer science students.

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Institutional Case studies

Saint George's, University of London

The impact of eViP was two-fold (i) on the awareness, development and embedding of VPs in the SGUL curriculum (ii) upon the growing links with other institutions beginning to use VPs in their own curricula.

At the time of the application to the EC for the eViP project (Autumn 2006), SGUL possessed a number of virtual patients which had been constructed in a simple web-based format and not in a dedicated virtual patient system, and these had been transferred to Labyrinth before the start of the project in September 2007, to comply with the requirements of the DOW. However at that stage none of the VPs had been used in the curriculum, and there were no firm plans to do so.

2007

By the end of 2007, at St George's the impact of the EC-funded eViP award had become apparent in several ways:-

- The Teaching and Learning Committees had been made aware of the potential availability of a large number of virtual patients to enrich the curriculum, and members of the committee were positively influenced by the knowledge that several European institutions were taking VP seriously
- The high profile of VPs at AMEE had a major impact on the leading teaching and learning staff who attended AMEE, and was a factor in the acceptance that VPs would later be allowed to change the curriculum
- The Labyrinth-based virtual patients were now being tested for use in tutorial sessions, during the clinical attachments in Paediatrics.

Stimulated by this high profile of VPs, the e-Learning Unit and the paediatric consultant were encouraged:-

(i) to develop VP creation workshops, intended for the conversion of linear patient cases into interactive branching VPs

(ii) to run a single case trial of the replacement of paper Problem Based Learning patient cases, with an online interactive Virtual Patient. (a test to establish the process was feasible and "did no harm"). The response of staff and students was immediately positive and the eLearning unit were then asked to trial the process in a complete module the following year.

A virtual patient in Labyrinth, with optional routes through the case

OpenLabyrinth HOME CREATE USERS MY ACCOUNT HELP LOGOFF

Start Here

Its the 16th February 2004, its 21.00. You are a GP at home on-call for your rural practise.

You are enjoying a cup of tea at home and the phone rings. It is 6 month old Sarah-Jane Pritchard's mother. You remember Sarah-Jane was born at 28 weeks and was ventilated for 3 weeks.

Her mother tells you that Sarah-Jane has taken only 2 Oz. of milk all day and has a tickly cough. She would like you to come and see Sarah-Jane.

What would you like to do?

Call ambulance

Ask to phone if worsens

Go and see

Ask to come to surgery now

Review in the morning

Case Information

Case: Sarah-Jane (presentation) (893)
ID: 29208

[Restart Case](#)

Case Pathway

[Review your pathway](#)

Case Score

2008

This was a year when St George's began to explore the range of opportunities which VPs could offer for student learning, in a variety of different projects:

VP/PBL Trial: The embedding of VPs directly into the core structure of the curriculum was trialled. The successful test in 2007 of the interactive virtual patient replacing PBL, was followed by a full controlled trial of the replacement of PBL under controlled conditions. A PBL module was converted to VPs, and delivered to 72 students in 10 tutorial groups, with 5 groups each week receiving VPs with options and consequences, and 5 groups receiving online VPs but without options. A comprehensive evaluation was carried out.

Both tutors and students believed that the ability to explore options and consequences created a more engaging experience, and encouraged students to explore their learning. Both students and tutors believed the students learned more. VPs were contributing adding new opportunities for decision-making.

REViP: Cross-institutional Collaborative studies began to explore and evaluate the embedding of repurposed and enriched Virtual Patients, originally constructed in the Department of Paediatrics at Heidelberg University (VPs), and adapted for the Paediatrics component of the St George's medical curriculum. This highly successful project again raised the profile of VPs in clinical medicine.

PREVIEW: The concentration of interest on virtual patients had led to another successful project funded with £200,000 of funding provided by the JISC under the Users and Innovations programme. This explored the value of developing and using interactive patients in an virtual world for scenario-based training for paramedic students. The project included the adaptation of scenarios to use the International VP standard for interoperability between the Second life mannequins and text-based virtual patient systems to allowed rapid import of new scenarios into the mannequins. Extensive quantitative and qualitative evaluations have been carried at every level of the project, to feed back on the value of a more immersive

environment for delivery of the virtual patient delivery. The project has been short-listed from 600 applications for the Times Higher Education ‘Outstanding ICT’ Initiative award.

A paramedic training scenario in Second life - a collapsed patient on the Underground



2009

The Generation 4 project: VPs were now seen to have come of age at St Georges as a vital learning resource, and the final step in the embedding of virtual patients came with funding from the Joint Information Systems Committee (JISC) to transform its curriculum using interactive VPs. SGUL is now adapting the transitional year between the early campus years and the clinical attachment years replacing the linear paper cases in its Problem-Based Learning course with interactive online virtual patients.

This was the first time that VPs had been placed at the heart of the curriculum structure, as the core learning resource as opposed to their use as supporting resources. The objective was the creation of a more adaptive, personalised, competency-based style of learning which more closely matched the role of the practitioner.

Interactive virtual patients in Problem-Based Learning



In a final step, St George's is now seeing a large number of collaborations emerging with European and non-European partners, which stitch together the use of VPs between a range of institutions, with SGUL acting as a mini-hub for virtual patient creation workshops and support. In addition to our involvement with many European institutions, currently we are also collaborating with the American Association Medical Colleges, the Australian Northern Territories General Practice Education network, and a 5-university collaboration in Japan.

As the Deputy Principal of St George's said "though many factors are involved in these [VP] developments, none of this would have happened without the original EC funding which created critical mass in VP development throughout Europe"

Institutional Case studies

University of Heidelberg

Before the start of eViP project virtual patients (VPs) had been under development and in regular curricular use for several years at the University of Heidelberg. They were used mainly in paediatric courses during undergraduate medical education.

Under the impact of eViP, the use of VPs has increased and expanded in several ways by using and re-using already existing VPs, e.g. to other teaching and learning scenarios, to other health care disciplines or to postgraduate medical education.

In addition, a new software component has been developed, to facilitate the use of VPs from other VP-Systems that are compatible with the newly developed technical eViP-VP-standard.

2007

Repurposing VPs for interprofessional education at an international student healthcare symposium:

The eViP pilot study was the first step in our repurposing experiences. During the World Healthcare Students' Symposium (WorldHSS) 300 undergraduate medical, pharmacy, nursing and allied health students participated in a study with two pre-existing VPs that were specifically repurposed for this study. This included repurposing for different health care subjects, to English language and for a different educational scenario. The evaluation results and feedback from the students was extremely positive. A big majority of students would like to have VPs as part of their education.



Students at the WorldHSS 2007 in Portugal participating in the VP pilot study.

2008

The highly positive outcome encouraged the Centre for Virtual Patients in Heidelberg and members of other faculties to further explore the possibilities of VPs' adaptation and use for other disciplines and scenarios.

Repurposing VPs for preclinical education:

In German medical education, the curriculum of years 1 and 2 consist mainly of basic sciences like anatomy, biochemistry and physiology. In a pilot study already existing VPs from the field of paediatrics were modified and repurposed for teaching basic sciences as well as clinical knowledge to first and second year medical students. The evaluation results were overwhelmingly positive with 92,3% of the students considering the linkage between basic and clinical knowledge successful and asking for more VPs as part of their studies (Oberle et al. 2009).

Repurposing for the longitudinal institutional VP project Heidelberg

As a result of the positive evaluation results of the implemented VPS, VPs are now more and more used in the basic sciences as well as in other medical subjects (e.g. Child and Youth psychiatry) as part of an institutional longitudinal VP project at the University of Heidelberg.

Repurposing VPs for clinical reasoning:

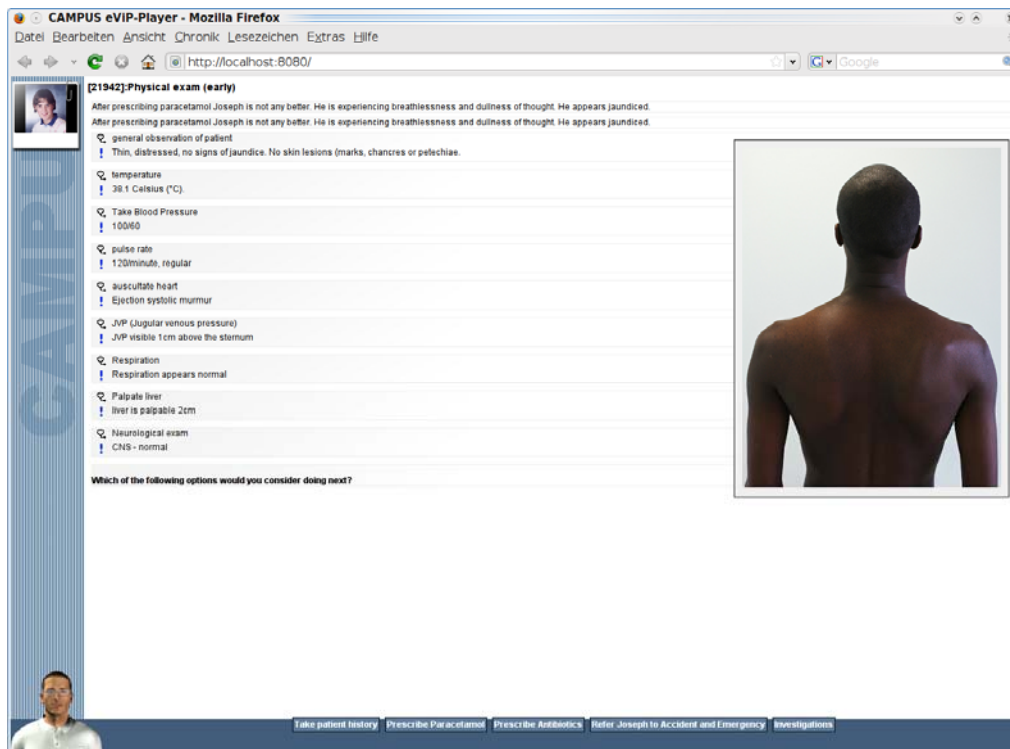
Another project originating from the eViP-project was the repurposing of VPs to a new educational scenario. Clinical reasoning is considered one of the main learning goals in medical education. Therefore already existing VPs were modified and repurposed by explicitly implementing methods for fostering clinical reasoning and design principles for VPs (Hanebeck et al 2009).

Repurposing VPs from branched to linear

Furthermore semi-linear existing Paediatric VPs from Heidelberg were transformed into a branched version of the VP at St. George's, University of London. As part of a study, these altered and branched VPs of the Open Labyrinth System were again transformed into linear VPs in the CAMPUS Card Player (Balasubramaniam et al 2009).

Development of the CAMPUS eViP player:

On the technical side, the development and establishment of a common eViP-standard for VPs initiated the development of a new software component of the CAMPUS Virtual Patient System, the new CAMPUS eViP-Player. It features the capability to play back the eViP-standard-compliant VPs from all partners' systems and is under constant development as a new component of the CAMPUS Virtual Patient System.



Screenshot of the new CAMPUS eViP-Player, playing a OpenLabyrinth case

2009

Repurposing VPs for postgraduate education:

In order to expand the use of VPs not only to pre- but also to postgraduate education in a pilot study two paediatric VPs from the CAMPUS System were repurposed for residents in paediatric specialist training. The cases were used during a two-day seminar of the DGKJ (German Society of Child and Youth Medicine) in Heidelberg as a wrap-up after lecture and were specifically adapted to the corresponding lecture and the residents' level of knowledge. The evaluation results and feedback were very positive (Oberle et al. 2009).

Repurposing VPs as preparation for skills lab training

Another project initiated under the influence of the eViP-project in Heidelberg is the use of VPs as preparation for skills lab training as part of the paediatric curriculum in undergraduate medical education. Already existing VPs were repurposed from semi-linear to linear structure and enriched with the theoretical background necessary for the skills. Students were required to complete the VP before being allowed to participate in the skills training in order to be able focus on training the practical skills. Evaluation results using the evip questionnaires were highly positive and VPs as skills lab preparation are now a regular part of the curriculum (Lehmann et al. 2009).

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Institutional Case studies

LMU Munich

History of VP use at LMU

Integration of Virtual patients (VPs) has a long tradition at the medical faculty of the LMU Munich. In the mid 90s the first computer-based VPs in radiology and internal medicine were introduced and their effect and benefit were investigated in various studies. It was a long way from these first steps to the current situation with having 25 courses embedded in the medical curriculum beginning from second year until final year. Casus even has a longer tradition, it was developed from 1993 until 2001 at the LMU and later on further developed and distributed by a spin-off company (Instruct).

At the beginning of the eVip project in 2007 already 20 courses containing an average of 5 VPs were implemented in the curriculum using mainly Casus, but also other systems like WEB-CT as VP players. These modules are mainly embedded as self-directed learning units to complement lectures, bed-side teaching or seminars. But in some contexts VPs are also embedded as assessment tools, e.g. for an OSCE station. 3 courses were implemented as voluntary additional offer, not officially embedded in the curriculum. An exchange of VPs within Casus on a national basis was already well established before eVip, for example with partner universities in Düsseldorf, Dresden or Aachen. Also projects like the bmbf- project Caseport aimed on sharing VPs across different VP systems.

In cooperation with the Virtual University of Bavaria (vhb) 5 courses were offered for all medical students from Bavaria via their platform.

Impact of eViP on VP creation

This long history of using VPs raises the problem of keeping VPs up-to-date, especially if authors are no longer available. There is a need of updating VPs continuously concerning new research findings, new therapy methods or guideline changes. But also a formal/technical update like checking hyperlink availability or integrating new didactical approaches is an important step. Therefore it is crucial to be able to update or even replace such abandoned VPs. In this context eVip offered a unique opportunity to overcome these rising issues and fill the gaps with high-quality VPs from the partner(-systems), without having to create them from scratch.

Therefore during 2007 and 2008 in the context of eVip a needs analysis was performed to determine where VPs or even complete courses of VPs could be a didactically useful addition/replacement within the medical curriculum.

In 2008 a new course of repurposed and enriched VPs from continuing medical education (CME) adapted to final year medical students level was created and offered as a revision course before the final exam.

For several other courses especially in internal medicine and interdisciplinary courses VPs have been replaced with new ones originating from eVip partners or VPs have been added to extend the covered learning objectives of a module. A content domain not yet covered with VPs, but identified as didactically useful is the field of obstetrics/gynaecology. In this area repurposing is ongoing and VPs will be integrated into the curriculum in 2010.

Impact of eViP on teaching methods

In contrast to the well-covered area of self-directed VPs, VPs used for PBL tutorials at LMU are still paper-based. Here eVip offers a great opportunity to share experiences of other partners in implementing VPs for a tutorial setting. Discussion about this has just begun, especially in the field of internal medicine but eVip already has led to a risen awareness among teachers at our faculty about electronic VPs, VP systems and the opportunity of integrating these in a tutorial.

Impact of eViP on students at LMU

But eViP had another effect on the medical students at LMU - due to the rising awareness of eViP and the research and collaboration going on in the field of virtual patients, we recognized increasing interest of students in writing their doctoral thesis in the field of virtual patients, the repurposing process and integration of VPs into the curriculum.

Impact of eViP on sharing VPs internationally across systems

The sharing of VPs on a national basis was already well established at LMU before eViP. But there was no experience in sharing VPs across systems and on an international basis. This started within the eViP project and these experiences originating from this fruitful collaborations with the eViP partners has an important impact on the quality of VPs.

Since 2004 the Institute and Outpatient Clinic for Occupational, Social and Environmental Medicine of the LMU is project lead for another project co-funded by the European union - NetWoRM (Net-based-training for work-related medicine) and the follow-up Networm³. This project aims at sharing VPs in occupational medicine on an European basis within one VP system (Casus). Discussion started at the Krakow ICVP conference and is currently ongoing about how to share experiences and collaborate after the project endings.

Institutional Case studies

University of Warwick Medical School Becoming e-confident with virtual patients

Background to Warwick Medical School

Warwick Medical School (WMS) was established in 2000 as the UK's largest graduate-only medical school. WMS was initially set up as a partnership with the well established University of Leicester Medical School, but gained full independence in 2006. At that time it would be fair to say that the level of e-learning experience of most teachers was minimal, although there was excellent support provided by a small team of committed experts in IT Services. The general level of awareness of the potential of e-learning to enhance a modern medical curriculum was low, and e-learning content was almost non-existent beyond lecture handouts, PowerPoint files and a few online images and quizzes.

As a result of participating in eViP, and learning from partner sites, WMS is changing the way it contextualizes e-learning to take more of a virtual patient approach. An internally funded project has been established to join up e-learning and virtual patient development in the medical school and clinical teaching sites, and to establish a new HE/NHS learning & teaching forum to share good practice in creating virtual patient and associated content. We are exploring the wider use of virtual patients as an adjunct to simulation training. The University Hospitals Coventry & Warwickshire site is soon to open a new high fidelity simulation centre, and it is planned for virtual patients to form a part of the underlying training of students in this centre, providing continuity from the classroom, independent learning and e-learning activity, and simulation training.

As a result of being a relatively new school, access to high quality content is an issue, but the release of eViP virtual patients under a creative commons license enables WMS teachers to quickly embed a range of case studies throughout the curriculum. Without eViP it is unlikely the school would have gained this head start.

Challenges with international collaboration - a lesson for eViP

During WMS' first year as an independent medical school a new senior appointment was made to bring e-learning experience and expertise to the graduate-entry MBChB. At the same time the school joined the International Virtual Medical School (IVIMEDS), a non-profit subscription-based international consortium of medical schools with a shared interest in medical education and e-learning. One of the goals of IVIMEDS, and a principal reason for WMS joining, was to create and share a repository of virtual patients. IVIMEDS started well with enthusiasm from member institutions, including some innovative ideas for sharing resources and an early approach to virtual patients. But almost inevitably as a subscription-based organization it ran into funding difficulties mid-way through creating its content resources. Partners were in effect paying forward for the future development of e-learning resources including virtual patients, rather than paying to access an existing repository. Many institutions felt frustration at the perceived lack of progress and withdrew their membership, or delayed payment. This further impacted on the ability to deliver tools and content leading to an inevitable rapid decline in the membership base, available financial resources and ability to deliver credible product. Although the goals of IVIMEDS were laudable and credible, the business plan was not. The response to funding issues was to move focus away from creating

a bank of virtual patients, and instead creating a software authoring tool. This has not resulted in the breadth and depth of virtual patients that partners, especially WMS needed.

The IVIMEDS story is a warning to any international consortium setting out to share resources. Two important lessons need to be learnt. The first is that you need a product. A shared vision is important, but perhaps not so important as a real product that can be used now. In the case of IVIMEDS the product shifted away from virtual patient content, but towards a software tool. At least as far as WMS was concerned it was the content that was important. The strategic benefit of eViP to WMS is that eViP has concentrated on creating access to content, while at the same time ensuring that the range of existing virtual patient tools are technically compatible. Because most of these existing software tools are either free or open source, institutions such as WMS can select one or more tools that meet curriculum requirements, and be confident that content is compatible across each.

The need for a sustainable business plan

The second important lesson to learn from IVIMEDS is the need for a workable business plan. All activity costs money, and someone needs to pay. Consortia of institutions can bring much good will and waived costs, but ultimately there needs to be expenditure on maintenance, update and new development if a collaboration is to remain relevant and competitive. We have moved away from a market willing to pay for goods, towards one that might pay for services instead with an expectation that the goods will be free. It is unlikely in the near future that a consortium or group will be able to sustain revenue from selling content, instead they must look to models that add value to free underlying content. This is why those institutions that sell their curricula are making money while those selling their content are not. This is an important lesson for eViP as it enters its final project year. Establishing a sound and sustainable plan for continued access to the bank of repurposed virtual patients is key.

At WMS, as a backdrop to its membership of IVIMEDS and its own internal efforts to increase the uptake of e-learning in general and virtual patients in particular, the eViP project came at just the right time, within 12 months of WMS gaining independence. What the eViP project has offered WMS is a workable model for sharing and use of virtual patients and their underlying e-content. Instead of just providing virtual patient content, eViP has provided tools and guides for teachers and technologists to become confident in developing their own virtual patient cases. For the academic year 2008-9 the WMS story has been one of becoming e-confident. We have gained in maturity as an institution using e-learning. An MBChB curriculum review starting in summer 2009 led by the Associate Dean for Learning & Teaching Professor Neil Johnson, and the Director of the Institute for Clinical Education Professor Jill Thistlethwaite is providing a forum for the discussion of a restructuring of the MBChB along the lines of a more vertically integrated curriculum with a core set of patient case studies including virtual patients. This will offer students are more integrated learning experience with early clinical relevance to basic science teaching.

New curriculum opportunities

WMS plans to use eViP virtual patients throughout the MBChB curriculum. Phase I of the current course is largely medical school-based focusing on biological science and the integrated health sciences with some early primary care and clinical skills training. Phase II is delivered mainly in the teaching hospitals and general practice settings, not at the university. The partner NHS teaching sites are developing their own capability to produce and deliver e-learning content, sometimes in conjunction with the medical school but sometimes independently. As content development and web publishing tools become easier to use, there is both an opportunity and a threat to the way e-learning content is created and made available

to students. Individual consultants, specialist registrars and other junior trainees are making their own e-learning content – for example to deliver case-based or virtual patient content with clinical records, sometimes without recourse to any central control, quality assurance, or rights/consents checking. With devolved budgets, specifically SIFT (service increment for teaching), hospital and primary care trusts are able to pursue their own strategies independently from the medical school and university. A joined up approach is needed to coordinate the production and delivery of e-learning across the university and NHS to ensure that the quality of experience for our students is comparable as students rotate through the different clinical settings. In addition, by making explicit links with Foundation training for NHS postgraduates, we will help to address the transition from undergraduate study to the workplace. The foundation years are the first two years of a newly graduated doctor's postgraduate training. A high proportion of the foundation doctors at within our partner hospitals are Warwick graduates.

Medical education research

More recently, a specialist registrar Dr James Bateman has applied for a medical education PhD starting February 2010 to work specifically in the virtual patients field, investigating how the structure of virtual patients support the acquisition of clinical decision making skills. Early links with eViP have produced a number of education research opportunities and the diversity of virtual patient approaches amongst eViP partners asks a number of important research questions such as how to students learn from virtual patients, how does virtual patient structure affect clinical decision making, and how can virtual patients integrate with an assessment strategy.

Summary

All this from a school that only became independent at the end of 2006 is exciting progress, and experience gained with eViP has been a significant contributory factor to becoming an e-confident school.

Institutional Case Studies

Maastricht University

2007/2008

At the start of the e-ViP project (September 2007) Maastricht University had a number of virtual patients built in a German version of the CAMPUS authoring system, which were available for the Classic-Player. The existing structure and features of the German program did not always fit the educational needs of Maastricht University. In addition the locally installed version(s) caused problems in the development of new cases, the implementation of cases in the curriculum and the maintenance of both software and content. Finally, the virtual patients were developed for individual self study. All of these factors made the development and use of the virtual patients cumbersome and time consuming. In addition administrators, coordinators and teachers were unaware of the existence of the virtual patients or did not consider them as a serious option for the medical curriculum at Maastricht University. Students rarely used virtual patients voluntarily as an additional resource.

The collaboration with other European institutions in the e-ViP project and its funding by the EU made it possible for the Department of Educational Research and Development of the Faculty of Health, Medicine and Life Sciences to put virtual patients on the agenda as a learning tool for the undergraduate medical curriculum. The first goal was to adapt the structure and features of both program and cases to the Dutch Healthcare situation, to start using a web version for both the authoring system and the player program, and to repurpose and enrich the existing Dutch and German cases for small group learning in Problem Based Learning (PBL). All these development and changes were planned to be piloted in a mandatory course in the curriculum.

During 2007/2008: Repurposing, enriching and piloting of VPs in the undergraduate medical curriculum at Maastricht University.

The e-learning unit of the Educational Department of the Faculty of Health, Medicine and Life Sciences:

- Repurposed 2 VPs originating from the University of Heidelberg and 1 VP developed locally from a familiarisation VP (fVP) for individual use to an in-session VP (iVP) for small group use. For this the content was adapted to the Dutch culture and to PBL, the format was transformed from Java-based to html-based and integrated in the Learning Activity Management System (LAMS) Dokeos. Multiple choice questions and an electronic polling feature were added to the VP. This was piloted in a single case trial during a mandatory paediatric clerkship. The results were presented within the Faculty of Health, Medicine and Life Sciences, which increased the local awareness of and interest in VPs for the medical curriculum in Maastricht. Results were also presented at an international conference (1).



Figure 1 The repurposed VP 'Lars' in a web browser as part of a Dokeos learning path with English texts

- VPs that had been mainly developed for training in clinical reasoning were adapted to be used by undergraduate medical students to learn basic facts and concepts. For this we enriched media assets within the VPs. The Department of Educational Development and Research developed a Flash-based tool to present interactive images to learners in such a way that the level of interaction can be adjusted to the target group. The CAMPUS development team in Heidelberg developed a module that allows Animage to be incorporated in a CAMPUS virtual patient. This made it possible to reuse labelled images in several languages, without having to edit the image; to offer authentic imaging materials (e.g. X-ray) with labels that can be temporarily removed by the students; and to offer an interactive image on the anatomy that is relevant for the virtual patient.
- The use of these interactive images was piloted and the results were presented at national and international conferences (2,3). This increased the interest among basic science teachers in the use of VPs in our curriculum.

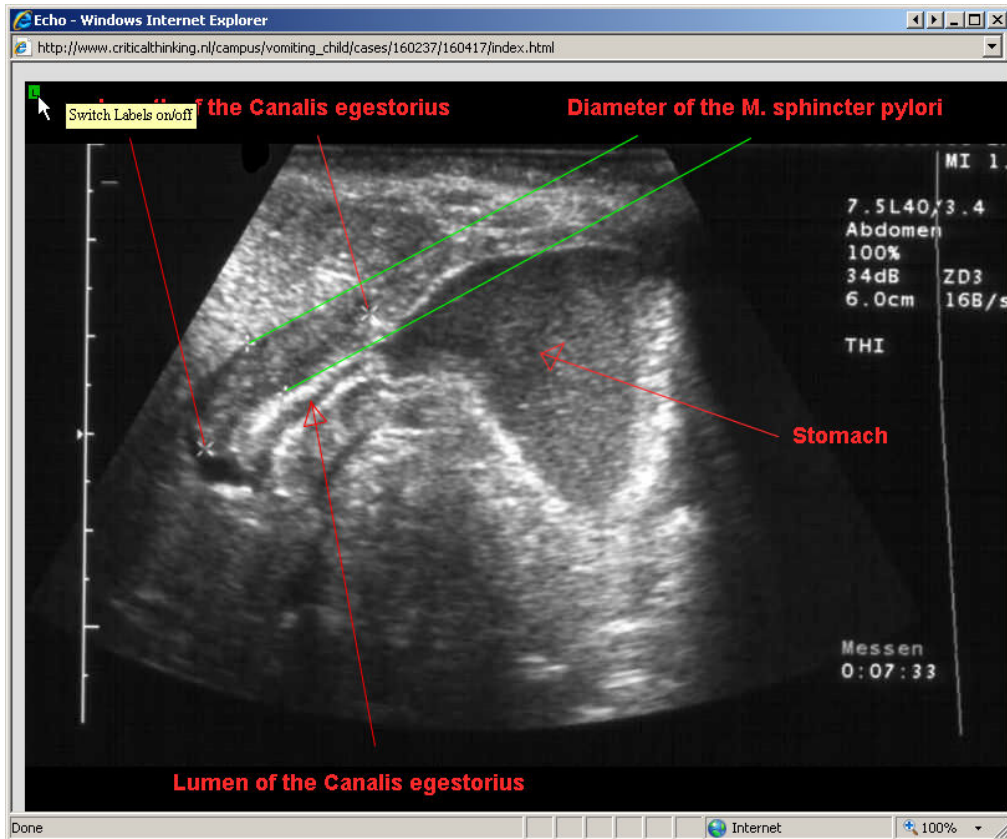


Figure 2 Enriched interactive image with English text.

During 2009: Repurposing, enriching, integrating and piloting VPs in residency training at Maxima Medical Centre, Veldhoven, the Netherlands.

The e-learning unit of the Educational Department of the Faculty of Health, Medicine and Life sciences:

- Repurposed 2 VPs for residency training by adding data on ‘premature closure’ (doctors failing to consider reasonable alternatives after reaching an initial diagnosis) in order to promote deliberate practice in trying to solve standardized cases known to be susceptible to cognitive errors.
- Enriched the media assets of the findings of the physical examination in which the handling of the stethoscope and the resulting sounds were synchronously presented on video.



Figure 3 Enriched findings of physical examinations with synchronized sounds on video.

- Integrated VPs in the training of clinical reasoning by combining the individual workup of VPs with corresponding teaching events. Reflection, discussion and feedback on data gathering and the synthesis of the information were promoted by punctuating the case workup with several ‘time outs’ in small groups.
- Developed support for small group discussions by logging, aggregating and feeding back the actions of all the trainees to the group by means of a feedback tool.

none all			<<< >>>		none all			<<< >>>	
rank	item	aggregate			rank	item	aggregate		
1	Diarrhoea and gastroenteritis of presumed infectious origin	4			1	Viral and other specified intestinal infections	4		
6	Urinary tract infection, site not specified	2			2	Acute appendicitis	4		
1	Acute appendicitis	1			1	Diarrhoea and gastroenteritis of presumed infectious origin	1		
2	Malignant neoplasm: Other sarcomas of liver	1			3	Ulcerative colitis	1		
2	Noninfective gastroenteritis and colitis, unspecified	1			3	Intestinal parasitism, unspecified	1		
2	Diarrhoea and gastroenteritis of presumed infectious origin	1			4	Urinary tract infection, site not specified	1		
2	Intestinal parasitism, unspecified	1			6 records found, showing page 1 of 1.				
2	Secondary malignant neoplasm of liver	1							
3	Acute appendicitis	1							
3	Malignant neoplasm: Liver, unspecified	1							
3	Ulcerative colitis	1							
3	Intestinal parasitism, unspecified	1							
4	Crohn's disease, unspecified	1							
4	Constipation	1							
4	Noninfective gastroenteritis and colitis, unspecified	1							
5	Nonspecific mesenteric lymphadenitis	1							
5	Malignant neoplasm: Other sarcomas of liver	1							
5	Other pneumonia, organism unspecified	1							

- Piloted this new VP scenario at Maxima Medical Centre and presented the results internally at Maastricht University and at an international conference (4). This increased clinical teachers’ and curriculum coordinators’ interest in the use of VPs in the Maastricht curriculum.

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Institutional Case Studies

CLUJ

At the time when we become partners in eViP project our University experience with VP's was limited to the educational website www.med-online.ro, with medical algorithms and interactive clinical cases in html template². We used the first two Web-SP English VP's offered by Karolinska Institutet to explore our students satisfaction with computer case simulations³.

As partners in eViP project we translated the Web-SP template into Romanian and generate four templates for case development, male and female, simple and complex. It soon became evident that the success of the program depends on teacher participation in VP's development and use. We wrote a guide for Web-SP case developers and make two workshops, as a part of the program of faculty development run by the Department of Medical Education. The case authors belong to different departments, a condition for dissemination of the VP's use and curriculum integration. It is our intention to continue the faculty training in computer simulation through the educational grant "MEDCAMP", an POSDRU project in which we have as partners Babes-Bolyai University and Technical University from Cluj-Napoca, Romania.

In the two years of the project we built a database with VP's for different medical specialities. At the moment VP's are used in fourteen courses, mainly as support for case based learning. There is need of more effort to develop a systematic program of curriculum implementation of VP's. In order to get the technical and financial support we applied for two grants, a Tempus Joint Project, "Development of a Medical Educational Centre – infrastructure for curricula modernization in the view of Bologna Process", Tempus IV second call for proposals EAC/01/2009, partners Karolinska Institute, Medical University of Vienna, St George's University of London, University of Szeged, SBC-Scientific & Biomedical Information Centre Kallithea, Jordan University of Science and Technology, University of Jordan, Tbilisi State Medical University, AIETI Medical School Tbilisi and an program for development of simulations in education, POSDRU - strategic project 2009 (European funding), "Simulation in education and professional counseling for medical students", with partners Vienna Medicine University, Dundee University, "Victor Babes" University, Timisoara and S.C. Amprenta S.R.L.

From the second year of the project we started with our partners form Virtual Patient Laboratory, Karolinska Institutet, Stockholm, Sweden, a research of cross-cultural use of VP's. The results of the studies of students language proficiency impact on cross-cultural use of virtual patients were presented in Krakow⁴ and Malaga⁵ this year and published in Medical Teacher⁶

Finally and 'most importantly, as partners in eViP project we became members of an e-learning community. Our participation in project meetings with our partners in the project and the visits in Cluj of Karolinska team, St George's University and technical group were

² V.Muntean, N.Miu. www.med-online.ro. An Educational database with medical algorithms. AMEE Genova, 2006.

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⁴ V.Muntean, U.Fors, N.Zary, T.Calinici. Students Language Proficiency and Cross-Cultural Use of Virtual Patients, International conference on Virtual Patients, Krakow 2009.

⁵ V.Muntean, U.Fors, N.Zary, S.Tigan, T.Calinici. Language Proficiency and VP's Cross-Cultural Use. AMEE Malaga, 2009.

⁶ U.G.H.Fors, V.Muntean, M.Botezatu, N.Zary. Cross-cultural use and development of virtual patients. Med Teach, 2009, 31(8):739-743.

valuable and rich learning experience for us, and an opportunity to know experts and make friends.